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(54) METHOD AND DEVICE FOR OBTAINING CHANNEL STATE INFORMATION

(57) Embodiments of the present invention disclose a method and an apparatus for obtaining channel state information, so as to solve a problem that a feedback mechanism is inflexible when obtaining CSI of wireless channels between different transmission points and a user equipment is implemented. The method includes: first, receiving, by a user equipment, at least two channel state information CSI measurement reference resource sets sent by a base station; then, measuring, by the user equipment according to each CSI measurement reference set of the at least two channel state information CSI measurement reference resource sets, CSI between the user equipment and a transmission point and/or a transmission point combination corresponding to each CSI measurement reference resource set, and obtaining a feedback mechanism satisfying a requirement of the CSI between the user equipment and the transmission point and/or the transmission point combination; and finally, feeding back, by the user equipment, a measurement result to the base station through the same or different feedback mechanisms. The present invention is applicable to the field of communications systems.

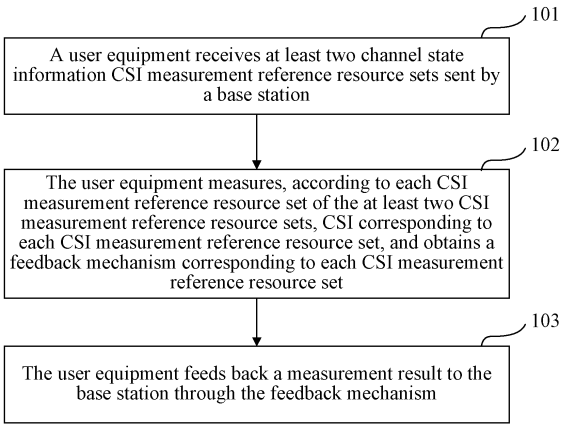

FIG. 1

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Description

[0001] This application claims priority to Chinese Patent Application No. 201110418223.6, filed with the Chinese Patent Office on December 14, 2011 and entitled "METHOD AND APPARATUS FOR OBTAINING CHANNEL STATE INFORMATION", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present invention relates to the field of communications system, and in particular, to a method and an apparatus for obtaining channel state information.

BACKGROUND

[0003] In a conventional wireless communications system, each user equipment (User Equipment, UE) usually receives data and signaling information sent from one cell only, where each cell includes one or more transmission points having a transmitting and receiving apparatus. One transmission point having a transmitting and receiving apparatus may correspond to one or more antennas. Persons skilled in the art may easily understand that a "cell" or a "transmission point corresponding to the cell" in the following indicate the same meaning.

[0004] Usually, to enable a base station to perform reasonable scheduling, the base station needs to learn channel state information (Channel State Information, CSI) of a wireless channel between a transmission point and a UE. The UE usually measures a reference signal (Reference Signal, RS) sent by the transmission point, and feeds back a measurement result to the base station, so as to obtain the information, for example, CIS-RS in an LTE-Advanced (further advancement of LTE) system,. In a CoMP (Coordinated Multiple Point transmission/reception, coordinated multiple point transmission/reception) system, to enable multiple transmission points to perform reasonable coordination, a base station in charge of scheduling needs to learn CSI of wireless channels between the multiple transmission points and the UE.

[0005] In the prior art, a base station sends information of one RS pattern and information of a group of RS available resources to a UE; on a first resource, a transmission point 1 sends an RS according to the RS pattern, and a transmission point 2 sends an RS not according to the RS pattern, where the first resource is a non-empty subset of the group of RS available resources; and on a second resource, the transmission point 2 sends the RS according to the RS pattern, and the transmission point 1 sends the RS not according to the RS pattern, where the second resource is a non-empty subset of the group of RS available resources. The UE measures the RSs on the two resources according to the RS pattern, and feeds back a measurement result; and the base station receives the measurement result fed back by the UE to obtain CSI between the transmission point 1 and the UE and CSI between the transmission point 2 and the UE.

[0006] In the prior art, obtaining CSI of wireless channels between different transmission points and a UE can be implemented. However, CSI on two resources is fed back to a base station by sharing the same feedback mechanism; as a result, a problem that when a user equipment feeds back CSI to a base station, a feedback mechanism is inflexible is caused.

SUMMARY

[0007] Embodiments of the present invention provide a method and an apparatus for obtaining channel state information, so as to solve a problem that a feedback mechanism is inflexible when obtaining CSI of wireless channels between different transmission points and a user equipment is implemented.

[0008] The embodiments of the present invention adopt the following technical solutions.

[0009] A method for obtaining channel state information includes:

receiving, by a user equipment, at least two channel state information CSI measurement reference resource sets sent by a base station, where reference signal RS resources included in different CSI measurement reference resource sets are different, RSs included in the different CSI measurement reference resource sets have different RS characteristics, and RSs included in the same CSI measurement reference resource set have the same RS characteristic;
measuring, by the user equipment according to each CSI measurement reference set of the at least two CSI measurement reference resource sets, CSI corresponding to each CSI measurement reference resource set, and obtaining a feedback mechanism corresponding to each CSI measurement reference resource set; and
feeding back, by the user equipment, a measurement result to the base station through the feedback mechanism, where the measurement result is CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set, and the transmission point is a device providing a service for the user equipment.

[0010] A user equipment includes:

a receiving unit, configured to receive at least two channel state information CSI measurement reference resource sets sent by a base station, where reference signal RS resources included in different CSI measurement reference resource sets are different, RSs included in the different CSI measurement reference resource sets have different RS

characteristics, and RSs included in the same CSI measurement reference resource set have the same RS characteristic;

a measurement obtaining unit, configured to measure, according to each CSI measurement reference set of the at least two CSI measurement reference resource sets received by the receiving unit, CSI corresponding to each CSI measurement reference resource set, and obtain a feedback mechanism corresponding to each CSI measurement reference resource set; and

a feedback unit, configured to feed back a measurement result to the base station through the feedback mechanism obtained by the measurement obtaining unit, where the measurement result is CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set, and the transmission point is a device providing a service for the user equipment.

[0011] Another method for obtaining channel state information includes:

sending, by a base station, at least two channel state information CSI measurement reference resource sets to a user equipment, so that the user equipment measures, according to each CSI measurement reference set of the at least two CSI measurement reference resource sets, CSI corresponding to each CSI measurement reference resource set, and obtains a feedback mechanism corresponding to each CSI measurement reference resource set; and

receiving, by the base station, a measurement result that is fed back by the user equipment through the feedback mechanism, where the measurement result is CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set, and the transmission point is a device providing a service for the user equipment.

[0012] Abase station includes:

a sending unit, configured to send at least two channel state information CSI measurement reference resource sets to a user equipment, so that the user equipment measures, according to each CSI measurement reference set of the at least two CSI measurement reference resource sets, CSI corresponding to each CSI measurement reference resource set, and obtains a feedback mechanism corresponding to each CSI measurement reference resource set; and

a receiving unit, configured to receive a measurement result that is fed back to the receiving unit by the user equipment through the feedback mechanism obtained by the user equipment, where the measurement result is CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set, and the transmission point is a device providing a service for the user equipment.

[0013] With the method and apparatus for obtaining channel state information provided in the embodiments of the present invention, first of all, a user equipment receives at least two channel state information CSI measurement reference resource sets sent by a base station; then, the user equipment measures, according to each CSI measurement reference set of the at least two channel state information CSI measurement reference resource sets, CSI between the user equipment and a transmission point and/or a transmission point combination corresponding to each CSI measurement reference resource set, and obtains the same or different feedback mechanisms satisfying a requirement of the CSI between the user equipment and the transmission point and/or the transmission point combination; and finally, the user equipment feeds back a measurement result to the base station through the same or different feedback mechanisms. In the prior art, CSI between a user equipment and different transmission points can be measured, but a feedback mechanism is inflexible when the user equipment feeds back a measurement result to a base station. In the solutions provided in the embodiments of the present invention, a user equipment adjusts a feedback mechanism according to different requirements on the feedback mechanism of CSI between the user equipment and different transmission points corresponding to CSI measurement reference resource sets sent by a base station, thereby solving a problem that a feedback mechanism is inflexible when a user equipment feeds back a measurement result to a base station in the prior art.

BRIEF DESCRIPTION OF DRAWINGS

[0014] To describe the technical solutions in the embodiments of the present invention more clearly, the accompanying drawings required for describing the embodiments or the prior art are introduced briefly in the following. Apparently, the accompanying drawings in the following description only show some of the embodiments of the present invention, and persons of ordinary skill in the art may also obtain other drawings according to these accompanying drawings without creative efforts.

FIG. 1 is a flow chart of a method for obtaining channel state information according to an embodiment of the present invention;

FIG. 2 is a schematic structural diagram of a user equipment according to an embodiment of the present invention;

FIG. 3 is a flow chart of another method for obtaining channel state information according to an embodiment of the present invention;

FIG. 4 is a schematic structural diagram of a base station according to an embodiment of the present invention;

FIG. 5 is a configuration diagram of a sending time point of a reference signal according to an embodiment of the present invention;

FIG. 6 is a pattern of an RS sent by a transmission point 1 on a first RS resource according to an embodiment of the present invention;

FIG. 7 is a pattern of an RS sent by a transmission point 2 on a first RS resource according to an embodiment of the present invention;

FIG. 8 is a pattern of an RS sent by a transmission point 1 on a second RS resource according to an embodiment of the present invention;

FIG. 9 is a pattern of an RS sent by a transmission point 2 on a second RS resource according to an embodiment of the present invention;

FIG. 10 is a pattern of an RS sent by a transmission point 1 on a first RS resource according to an embodiment of the present invention;

FIG. 11 is a pattern of an RS sent by a transmission point 1 on a second RS resource according to an embodiment of the present invention; and

FIG. 12 is a pattern of an RS sent by a transmission point 2 on a second RS resource according to an embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0015] The technical solutions in the embodiments of the present invention are clearly and completely described in the following with reference to the accompanying drawings in the embodiments of the present invention. Apparently, the embodiments to be described are only a part rather than all of the embodiments of the present invention. All other embodiments obtained by persons skilled in the art based on the embodiments of the present invention without creative efforts shall fall within the protection scope of the present invention.

[0016] To make advantages of the technical solutions of the present invention clearer, the present invention is described in detail in the following with reference to the accompanying drawings and the embodiments.

[0017] FIG. 1 shows a method for obtaining channel state information according to an embodiment of the present invention, and the method includes:

101: A user equipment receives at least two channel state information CSI measurement reference resource sets sent by a base station.

[0018] Reference signal RS resources included in different CSI measurement reference resource sets are different; and RSs included in the different CSI measurement reference resource sets have different RS characteristics, and RSs included in the same CSI measurement reference resource set have the same RS characteristic. The RS resource is a time dimension resource (such as a sub-frame) or a frequency dimension resource (such as a sub-band) including an RS; the RS characteristic includes a transmission point that sends the RS, and a configuration of the RS; and the configuration of the RS includes the number of RS antenna ports, an RS pilot pattern, an RS period, and an RS sub-frame offset.

[0019] 102: The user equipment measures, according to each CSI measurement reference resource set of the at least two CSI measurement reference resource sets, CSI corresponding to each CSI measurement reference resource set, and obtains a feedback mechanism corresponding to each CSI measurement reference resource set.

[0020] Different CSI measurement reference sets in the at least two CSI measurement reference resource sets correspond to the same or different feedback mechanisms. The feedback mechanism may include a feedback mode, a feedback period, a frequency domain granularity, feedback triggering signaling, and the like.

[0021] 103: The user equipment feeds back a measurement result to the base station through the feedback mechanism.

[0022] The measurement result may be CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set; and the transmission point is a device providing a service for the user equipment, and specifically, the transmission point may be a device such as an antenna.

[0023] For example, two transmission points exist, which are a transmission point 1 and a transmission point 2. Multiple RS sending time point configurations are defined in the prior art. As shown in FIG. 5, when an RS sending time point configuration $I_{CSI\text{-}RS}$ is 36, an RS period is 40 transmission time intervals TTI, and an RS offset is 1, which indicates that the RS is sent on TTIs at time points of 1,41,81, 121, and the like. In this example, the RS sending time point configuration $I_{CSI\text{-}RS}$ that the base station configures for the UE is 0, which indicates that the RS period is 5 TTIs, and the RS offset is 0, that is, the RS is sent on TTIs at time points of 0, 5, 10, 15, and the like. An RS pattern that the base station configures for the UE is two REs: (9, 5) and (9, 6). The RS pattern represents an RS sending time point and frequency point (referred to as a time-frequency grid point). A TTI serves as a time unit for sending of a signal. The length of one TTI is 1 ms, including 14 symbols. One physical resource block (Physical Resource Block, PRB) is 12 sub-carriers within one TTI. Each sub-carrier on each symbol is referred to as one resource element (Resource Element, RE). Therefore, one PRB includes 12x14 REs, and each group of REs (including one or more REs) may be represented through (k, l).

[0024] On TTIs whose serial numbers are 0, 10, 20, ..., (a first RS resource), patterns of RSs sent by the transmission point 1 and the transmission point 2 are as shown in FIG. 6 and FIG. 7. For the same physical resource block PRB, the pattern of the RS sent by the transmission point 1 is two REs: (9, 5) and (9, 6), and the pattern of the RS sent by the transmission point 2 is two REs: (3, 5) and (3, 6).

[0025] On TTIs at the time points of 5, 15, 25, ..., (a second RS resource), patterns of RSs sent by the transmission point 1 and the transmission point 2 are as shown in FIG. 8 and FIG. 9. For the same PRB, the pattern of the RS sent by the transmission point 1 is two REs: (4, 5) and (4, 6), and the pattern of the RS sent by the transmission point 2 is two REs: (9, 5) and (9, 6).

[0026] An RS measured by the UE on the TTIs at the time points of 0, 10, 20, ..., and on the two REs (9, 5) and (9, 6), which form the pattern of the RS, is sent from the transmission point 1, while the TTIs at the time points of 0, 10, 20, ..., belong to a first CSI measurement reference resource set. Therefore, the UE can obtain first CSI between the transmission point 1 and the UE, and feed back the first CSI according to a feedback mechanism of the first CSI measurement reference resource set. An RS measured on the TTIs at the time points of 5, 15, 25, ..., and on the two REs (9, 5) and (9, 6), which form the pattern of the RS, is sent from the transmission point 2, while the TTIs at the time points of 5, 15, 25, ..., belong to a second CSI measurement reference resource set. Therefore, the UE can obtain second CSI between the transmission point 2 and the UE, and feed back the second CSI according to a feedback mechanism of the second CSI measurement reference resource set.

[0027] Specifically, the first CSI measurement reference resource set may be indicated by using a bitmap. Each bit of the bitmap corresponds to each TTI or TTI set. For example, if a value of a bit is "1", it indicates that a TTI or TTI set corresponding to the bit belongs to the first CSI measurement reference resource set; and if a value of a bit is "1", it indicates that a TTI or TTI set corresponding to the bit does not belong to the first CSI measurement reference resource set. The TTI set may be all TTIs within one RS period. Further, the second CSI measurement reference resource set may also be indicated by using a bitmap, and a specific method is similar to that of the first CSI measurement reference resource set, which is not described herein again.

[0028] For example, the length of the bitmap is 40 bits, which correspond to 40 consecutive TTIs. The first CSI measurement reference resource set may be represented by (10000 00000 10000 00000 10000 00000 10000 00000), or represented by (11111 00000 11111 00000 11111 00000 11111 00000).

[0029] When an RS resource adopts a frequency dimension, a method is similar to the foregoing method of the time dimension, as long as a TTI is replaced with a PRB, and a time point is replaced with a frequency.

[0030] Optionally, when the measurement result that needs to be fed back by the user equipment to the base station through the feedback mechanism is CSI between the user equipment and a transmission point combination, after receiving each CSI measurement reference resource set of the at least two channel state information CSI measurement reference resource sets sent by the base station, the user equipment further receives an RS configuration corresponding to each CSI measurement reference resource set, where the RS configuration includes at least one of the following information: the number of RS antenna ports, an RS pilot pattern, an RS period, and an RS sub-frame offset.

[0031] An RS pattern represents an RS sending time point and frequency point (referred to as a time-frequency grid point). A TTI serves as a time unit for sending of a signal. The length of one TTI is 1 ms, including 14 symbols. One physical resource block (Physical Resource Block, PRB) is 12 sub-carriers within one TTI. Each sub-carrier on each symbol is referred to as one resource element (Resource Element, RE). Therefore, one PRB includes 12x14 REs, and each group of REs (including one or more REs) may be represented through (k, 1).

[0032] At this time, the user equipment may measure, according to each CSI measurement reference resource set of the at least two CSI measurement reference resource sets and the RS configuration corresponding to each CSI measurement reference resource set, CSI between the user equipment and the transmission point combination corresponding to each CSI measurement reference resource set, and obtain a feedback mechanism satisfying a requirement of the CSI between the user equipment and the transmission point combination.

[0033] For example, two transmission points exist, which are a transmission point 1 and a transmission point 2. On TTIs at time points of 0, 10, 20, ..., (a first RS resource), a pattern of an RS sent by the transmission point 1 is as shown in FIG. 10. For the same PRB, the pattern of the RS sent by the transmission point 1 is two REs: (9, 5) and (9, 6).

[0034] On TTIs whose serial numbers are 5, 15, 25, ..., (a second RS resource), patterns of RSs sent by the transmission point 1 and the transmission point 2 are as shown in FIG. 11 and FIG. 12. For the same PRB, the pattern of the RS sent by the transmission point 1 is two REs: (11, 5) and (11, 6), and the pattern of the RS sent by the transmission point 2 is two REs: (5, 5) and (5, 6). (11, 5), (11, 6), (5, 5), and (5, 6) form a 4-port RS pattern.

[0035] A first RS pattern that the base station configures for the UE is two REs: (9, 5) and (9, 6); and a second RS pattern that the base station configures for the UE is four REs: (11, 5), (11, 6), (5, 5), and (5, 6).

[0036] An RS measured by the UE on the TTIs at the time points of 0, 10, 20, ..., and on the two REs (9, 5) and (9, 6), which form the pattern of the RS, is sent from the transmission point 1, while the TTIs at the time points of 0, 10, 20, ..., belong to a first CSI measurement reference resource set. Therefore, the UE can obtain first CSI between the transmission point 1 and the UE according to

the first CSI measurement reference resource set and the first RS pattern, and feed back the first CSI according to a feedback mechanism of the first CSI measurement reference resource set. An RS measured on the TTIs at the time points of 5, 15, 25, ..., and on the four REs (11, 5), (11, 6), (5, 5), and (5, 6), which form the pattern of the RS, is jointly sent by the transmission point 1 and the transmission point 2, while the TTIs at the time points of 5, 15, 25, ..., belong to a second CSI measurement reference resource set. Therefore, the UE can obtain second CSI between the UE and a combination of the transmission point 1 and that transmission point 2 according to the second CSI measurement reference resource set and the second RS pattern, and feed back the second CSI according to a feedback mechanism of the second CSI measurement reference resource set.

[0037] Specifically, the first CSI measurement reference resource set may be indicated by using a bitmap. Each bit of the bitmap corresponds to each TTI or TTI set. For example, if a value of a bit is "1", it indicates that a TTI or TTI set corresponding to the bit belongs to the first CSI measurement reference resource set; and if a value of a bit is "1", it indicates that a TTI or TTI set corresponding to the bit does not belong to the first CSI measurement reference resource set. The TTI set may be all TTIs within one RS period. Further, the second CSI measurement reference resource set may also be indicated by using a bitmap, and a specific method is similar to that of the first CSI measurement reference resource set, which is not described herein again.

[0038] For example, the length of the bitmap is 40 bits, which correspond to 40 consecutive TTIs. The first CSI measurement reference resource set may be represented by (10000 00000 10000 00000 10000 00000 10000 00000) or represented by (11111 00000 11111 00000 11111 00000 11111 00000).

[0039] When an RS resource adopts a frequency dimension, a method is similar to the foregoing method of the time dimension, as long as a TTI is replaced with a PRB, and a time point is replaced with a frequency.

[0040] FIG. 2 shows a user equipment according to an embodiment of the present invention. The user equipment includes: a receiving unit 21, a measurement obtaining unit 22, and a feedback unit 23.

[0041] The receiving unit 21 is configured to receive at least two channel state information CSI measurement reference resource sets sent by a base station, where reference signal RS resources included in different CSI measurement reference resource sets are different, RSs included in the different CSI measurement reference resource sets have different RS characteristics, and RSs included in the same CSI measurement reference resource set have the same RS characteristic.

[0042] The measurement obtaining unit 22 is configured to measure, according to each CSI measurement reference set of the at least two CSI measurement reference resource sets received by the receiving unit 21, CSI corresponding to each CSI measurement reference resource set, and obtain a feedback mechanism corresponding to each CSI measurement reference resource set.

[0043] Different CSI measurement reference sets in the at least two CSI measurement reference resource sets correspond to the same or different feedback mechanisms. The feedback mechanism may include a feedback mode, a feedback period, a frequency domain granularity, feedback triggering signaling, and the like.

[0044] The feedback unit 23 is configured to feed back a measurement result to the base station through the feedback mechanism obtained by the measurement obtaining unit 22.

[0045] The measurement result is CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set, and the transmission point is a device providing a service for the user equipment.

[0046] The receiving unit 21 is further configured to, when the measurement result that needs to be fed back by the feedback unit 23 to the base station through the feedback mechanism obtained by the measurement obtaining unit 22 is CSI between the user equipment and a transmission point combination, receive an RS configuration that is sent by the base station and corresponds to each CSI measurement reference resource set of the at least two CSI measurement reference resource sets, where the RS configuration includes at least one of the following information: the number of RS antenna ports, an RS pilot pattern, an RS period, and an RS sub-frame offset.

[0047] An RS pattern represents an RS sending time point and frequency point (referred to as a time-frequency grid point). A TTI serves as a time unit for sending of a signal. The length of one TTI is 1 ms, including 14 symbols. One physical resource block (Physical Resource Block, PRB) is 12 sub-carriers in one TTI. Each sub-carrier on each symbol is referred to as one resource element (Resource Element, RE). Therefore, one PRB includes 12×14 REs, and each group of REs (including one or more REs) may be represented through (k, 1).

[0048] The measurement obtaining unit 22 may further be configured to measure, according to each CSI measurement reference resource set received by the receiving unit 21 and the RS configuration corresponding to each CSI measurement reference resource set, CSI between the user equipment and the transmission point combination corresponding to each CSI measurement reference resource set, and obtain a feedback mechanism satisfying a requirement of the CSI between the user equipment and the transmission point combination.

[0049] A specific example is similar to the example in the method for obtaining channel state information shown in FIG. 1, which is not described herein again.

[0050] FIG. 3 shows another method for obtaining channel state information according to an embodiment of the present invention, and the method includes:

301: A base station sends at least two channel state information CSI measurement reference resource sets to a user equipment.

[0051] Further, the user equipment may be enabled to measure, according to each CSI measurement reference resource set of the at least two CSI measurement reference resource sets, CSI corresponding to each CSI measurement reference resource set, and obtain a feedback mechanism corresponding to each CSI measurement reference resource set.

[0052] Reference signal RS resources included in different CSI measurement reference resource sets are different; and RSs included in the different CSI measurement reference resource sets have different RS characteristics, and RSs included in the same CSI measurement reference resource set have the same RS characteristic. The RS resource is a time dimension resource (such as a sub-frame) or a frequency dimension resource (such as a sub-band) including an RS; the RS characteristic includes a transmission point that sends the RS, and a configuration of the RS; and the configuration of the RS includes the number of RS antenna ports, an RS pilot pattern, an RS period, and an RS sub-frame offset.

[0053] 302: The base station receives a measurement result that is fed back by the user equipment to the base station through the feedback mechanism, where the measurement result is CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set.

[0054] The measurement result may be CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set; and the transmission point is a device providing a service for the user equipment, and specifically, the transmission point may be a device such as an antenna.

[0055] A specific example of another method for obtaining channel state information shown in FIG. 3 is similar to the example in the method for obtaining channel state information shown in FIG. 1, which is not described herein again.

[0056] FIG. 4 shows a base station according to an embodiment of the present invention. The base station includes: a sending unit 41 and a receiving unit 42.

[0057] The sending unit 41 is configured to send at least two channel state information CSI measurement reference resource sets to a user equipment, so that the user equipment measures, according to each CSI measurement reference set of the at least two CSI measurement reference resource sets, CSI corresponding to each CSI measurement reference resource set, and obtains a feedback mechanism corresponding to each CSI measurement reference resource set.

[0058] Reference signal RS resources included in different CSI measurement reference resource sets are different; and RSs included in the different CSI measurement reference resource sets have different RS characteristics, and RSs included in the same CSI measurement reference resource set have the same RS characteristic. The RS resource is a time dimension resource (such as a sub-frame) or a frequency dimension resource (such as a sub-band) including an RS; the RS characteristic includes a transmission point that sends the RS, and a configuration of the RS; and the configuration of the RS includes the number of RS antenna ports, an RS pilot pattern, an RS period, and an RS sub-frame offset.

[0059] The sending unit 41 may further be configured to, when a measurement result that needs to be fed back by the user equipment to the receiving unit 42 through the feedback mechanism is CSI between the user equipment and a transmission point combination, send an RS configuration corresponding to each CSI measurement reference resource set of the at least two CSI measurement reference resource sets to the user equipment.

[0060] The receiving unit 42 is configured to receive a measurement result that is fed back by the user equipment through the feedback mechanism obtained by the user equipment, where the measurement result is CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set, and the transmission point is a device providing a service for the user equipment.

[0061] The measurement result may be CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set; and the transmission point is a device providing a service for the user equipment, and specifically, the transmission point may be a device such as an antenna.

[0062] A specific example of the base station shown in FIG. 4 is similar to the example in the method for obtaining channel state information shown in FIG. 1, which is not described herein again.

[0063] With the method and apparatus for obtaining channel state information provided in the embodiments of the present invention, a user equipment adjusts a feedback mechanism according to different requirements on the feedback mechanism of CSI between the user equipment and different transmission points corresponding to CSI measurement reference resource sets sent by a base station, thereby solving a problem that a feedback mechanism is inflexible when obtaining CSI of wireless channels between different transmission points and a user equipment is implemented in the prior art.

[0064] The user equipment and the base station provided in the embodiments of the present invention can implement the foregoing method embodiments; and for specific function implementation, reference is made to the description in the method embodiments, which is not described herein again. The method and apparatus for obtaining channel state information provided in the em-

bodiments of the present invention are applicable to the field of communications systems, but are not limited thereto.

[0065] Persons of ordinary skill in the art may understand that all or a part of the procedures of the methods according to the foregoing embodiments may be implemented by a program instructing relevant hardware. The program may be stored in a computer readable storage medium. When the program is run, the procedures of the methods according to the foregoing embodiments are performed. The storage medium may be a magnetic disk, an optical disk, a read-only memory (Read-Only Memory, ROM), or a random access memory (Random Access Memory, RAM).

[0066] The foregoing descriptions are only specific embodiments of the present invention, but are not intended to limit the protection scope of the present invention. Any variation or replacement that can be easily figured out by persons skilled in the art within the technical scope disclosed in the present invention shall all fall within the protection scope of the present invention. Therefore, the protection scope of the present invention shall be subject to the protection scope of the claims.

Claims

1. A method for obtaining channel state information, comprising:

   receiving, by a user equipment, at least two channel state information CSI measurement reference resource sets sent by a base station, wherein reference signal RS resources comprised in different CSI measurement reference resource sets are different, RSs comprised in the different CSI measurement reference resource sets have different RS characteristics, and RSs comprised in the same CSI measurement reference resource set have the same RS characteristic;

   measuring, by the user equipment according to each CSI measurement reference set of the at least two CSI measurement reference resource sets, CSI corresponding to each CSI measurement reference resource set, and obtaining a feedback mechanism corresponding to each CSI measurement reference resource set; and

   feeding back, by the user equipment, a measurement result to the base station through the feedback mechanism, wherein the measurement result is CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set, and the transmission point is a device providing a service for the user equipment.

2. The method according to claim 1, wherein the RS resource is a time dimension resource or a frequency dimension resource; and

   the RSs have the same characteristic, which comprises that: the RSs are sent by the same transmission point and the RSs have the same configuration, wherein the RSs have the same configuration, which comprises that: the RSs have the same number of antenna ports, the same RS pilot pattern, the same RS period, and the same RS sub-frame offset.

3. The method according to claim 1, wherein after the receiving, by the user equipment, at least two channel state information CSI measurement reference resource sets sent by a base station, the method further comprises:

   when the measurement result that needs to be fed back by the user equipment to the base station through the feedback mechanism is CSI between the user equipment and a transmission point combination, receiving, by the user equipment, an RS configuration that is sent by the base station and corresponds to each channel state information CSI measurement reference resource set of the at least two channel state information CSI measurement reference resource sets, wherein the RS configuration comprises at least one of the following information: the number of RS antenna ports, an RS pilot pattern, an RS period, and an RS sub-frame offset; and

   wherein the measuring, by the user equipment according to each CSI measurement reference set of the at least two CSI measurement reference resource sets, CSI corresponding to each CSI measurement reference resource set, and obtaining a feedback mechanism corresponding to each CSI measurement reference resource set comprises:

   measuring, by the user equipment according to each CSI measurement reference resource set and the RS configuration corresponding to each CSI measurement reference resource set, CSI between the user equipment and the transmission point combination corresponding to each CSI measurement reference resource set, and obtaining a feedback mechanism satisfying a requirement of the CSI between the user equipment and the transmission point combination.

4. A user equipment, comprising:

   a receiving unit, configured to receive at least two channel state information CSI measurement

reference resource sets sent by a base station, wherein reference signal RS resources comprised in different CSI measurement reference resource sets are different, RSs comprised in the different CSI measurement reference resource sets have different RS characteristics, and RSs comprised in the same CSI measurement reference resource set have the same RS characteristic;

a measurement obtaining unit, configured to measure, according to each CSI measurement reference set of the at least two CSI measurement reference resource sets received by the receiving unit, CSI corresponding to each CSI measurement reference resource set, and obtain a feedback mechanism corresponding to each CSI measurement reference resource set; and

a feedback unit, configured to feed back a measurement result to the base station through the feedback mechanism obtained by the measurement obtaining unit, wherein the measurement result is CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set, and the transmission point is a device providing a service for the user equipment.

5. The user equipment according to claim 4, wherein the RS resource comprised in the CSI measurement reference resource set received by the receiving unit is a time dimension resource or a frequency dimension resource; and

the RSs have the same characteristic, which comprises that: the RSs are sent by the same transmission point and the RSs have the same configuration, wherein the RSs have the same configuration, which comprises that: the RSs have the same number of antenna ports, the same RS pilot pattern, the same RS period, and the same RS sub-frame offset.

6. The user equipment according to claim 4, wherein,

the receiving unit is further configured to, when the measurement result that needs to be fed back by the feedback unit to the base station through the feedback mechanism obtained by the measurement obtaining unit is CSI between the user equipment and a transmission point combination, receive an RS configuration that is sent by the base station and corresponds to each CSI measurement reference resource set of the at least two CSI measurement reference resource sets, wherein the RS configuration comprises at least one of the following information: the number of RS antenna ports, an RS pilot pattern, an RS period, and an RS sub-frame offset; and

the measurement obtaining unit is further configured to measure, according to each CSI measurement reference resource set received by the receiving unit and the RS configuration corresponding to each CSI measurement reference resource set, CSI between the user equipment and the transmission point combination corresponding to each CSI measurement reference resource set, and obtain a feedback mechanism satisfying a requirement of the CSI between the user equipment and the transmission point combination.

7. A method for obtaining channel state information, comprising:

sending, by a base station, at least two channel state information CSI measurement reference resource sets to a user equipment, so that the user equipment measures, according to each CSI measurement reference set of the at least two CSI measurement reference resource sets, CSI corresponding to each CSI measurement reference resource set, and obtains a feedback mechanism corresponding to each CSI measurement reference resource set; and

receiving, by the base station, a measurement result that is fed back by the user equipment through the feedback mechanism, wherein the measurement result is CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set, and the transmission point is a device providing a service for the user equipment.

8. The method according to claim 7, wherein the RS resource is a time dimension resource or a frequency dimension resource; and

the RSs have the same characteristic, which comprises that: the RSs are sent by the same transmission point and the RSs have the same configuration, wherein the RSs have the same configuration, which comprises that: the RSs have the same number of antenna ports, the same RS pilot pattern, the same RS period, and the same RS sub-frame offset.

9. The method according to claim 7, wherein after the sending, by a base station, at least two channel state information CSI measurement reference resource sets to a user equipment, the method further comprises:

when the measurement result that needs to be fed back by the user equipment to the base station through the feedback mechanism is CSI between the user equipment and a transmission point combination, sending, by the base station,

an RS configuration corresponding to each channel state information CSI measurement reference resource set of the at least two channel state information CSI measurement reference resource sets to the user equipment, so that the user equipment measures, according to each CSI measurement reference resource set and the RS configuration corresponding to each CSI measurement reference resource set, CSI between the user equipment and the transmission point combination corresponding to each CSI measurement reference resource set, and obtains a feedback mechanism satisfying a requirement of the CSI between the user equipment and the transmission point combination.

10. Abase station, comprising:

a sending unit, configured to send at least two channel state information CSI measurement reference resource sets to a user equipment, so that the user equipment measures, according to each CSI measurement reference set of the at least two CSI measurement reference resource sets, CSI corresponding to each CSI measurement reference resource set, and obtains a feedback mechanism corresponding to each CSI measurement reference resource set; and
a receiving unit, configured to receive a measurement result that is fed back by the user equipment through the feedback mechanism obtained by the user equipment, wherein the measurement result is CSI between the user equipment and any one or a combination of transmission points among at least two transmission points each corresponding to each CSI measurement reference resource set, and the transmission point is a device providing a service for the user equipment.

11. The base station according to claim 10, wherein the RS resource comprised in the CSI measurement reference resource set sent by the sending unit is a time dimension resource or a frequency dimension resource; and
the RSs have the same characteristic, which comprises that: the RSs are sent by the same transmission point and the RSs have the same configuration, wherein the RSs have the same configuration, which comprises that: the RSs have the same number of antenna ports, the same RS pilot pattern, the same RS period, and the same RS sub-frame offset.

12. The base station according to claim 10, wherein:

the sending unit is further configured to, when the measurement result that needs to be fed back by the user equipment to the receiving unit through the feedback mechanism is CSI between the user equipment and a transmission point combination, send an RS configuration corresponding to each CSI measurement reference resource set of the at least two CSI measurement reference resource sets to the user equipment.

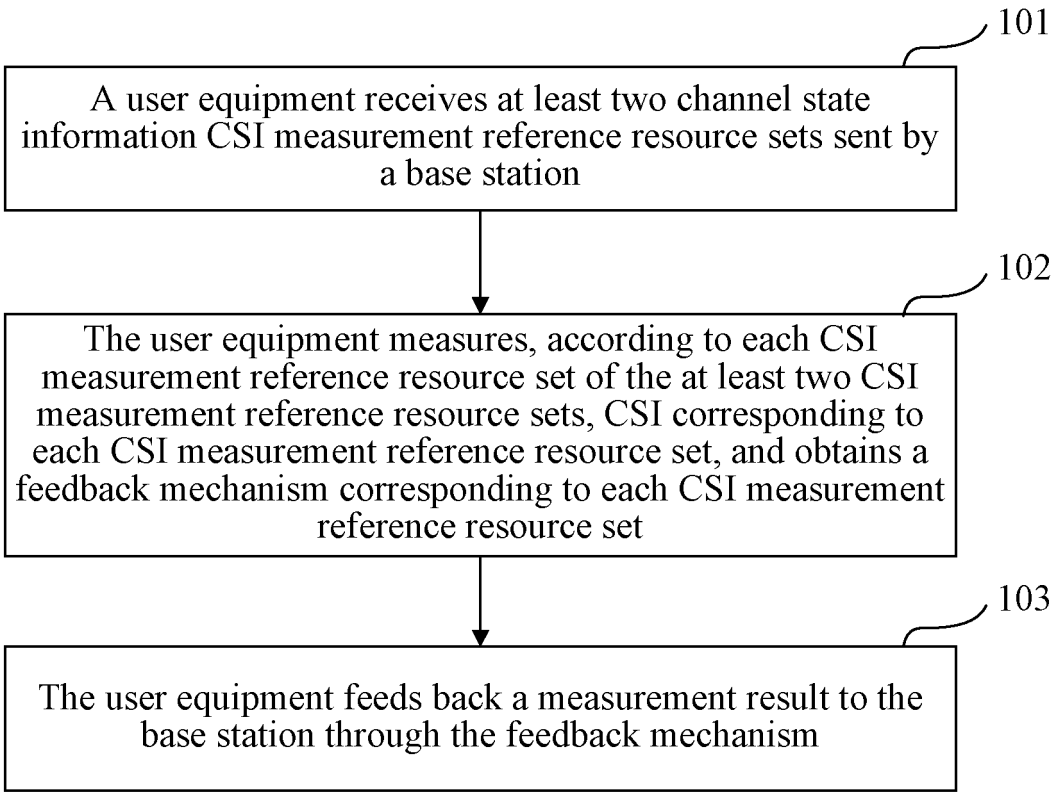
101
A user equipment receives at least two channel state information CSI measurement reference resource sets sent by a base station
102
The user equipment measures, according to each CSI measurement reference resource set of the at least two CSI measurement reference resource sets, CSI corresponding to each CSI measurement reference resource set, and obtains a feedback mechanism corresponding to each CSI measurement reference resource set
103
The user equipment feeds back a measurement result to the base station through the feedback mechanism

FIG. 1

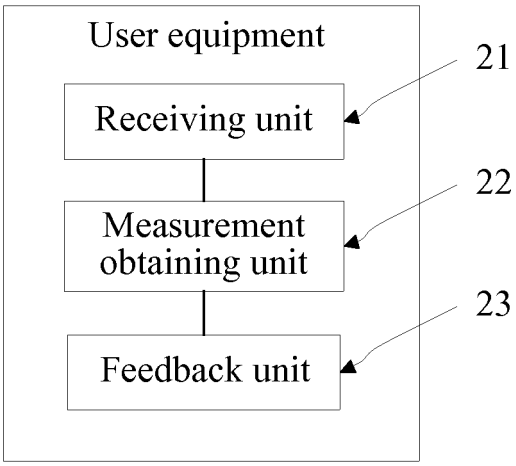
User equipment
21
Receiving unit
22
Measurement obtaining unit
23
Feedback unit

FIG. 2

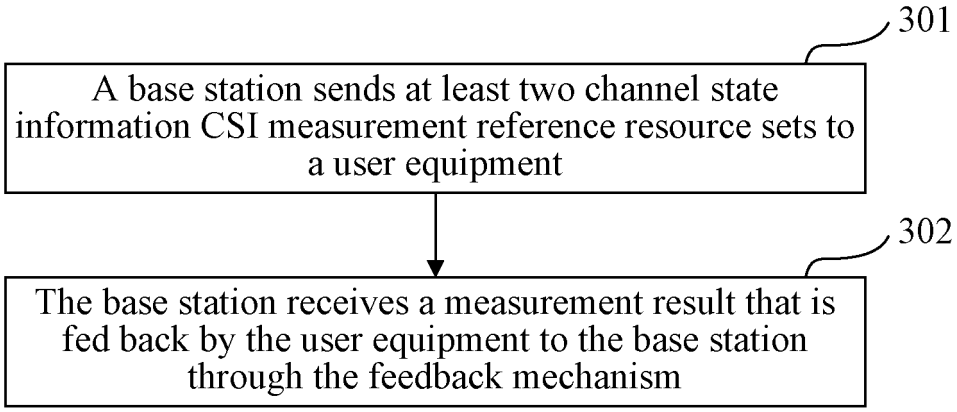

FIG. 3

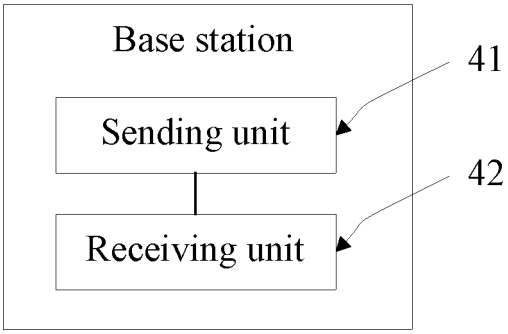

FIG. 4

RS sending time point configuration I_{CSI-RS}	RS period (unit: TTI)	RS offset (unit: TTI)
0 – 4	5	I_{CSI-RS}
5 – 14	10	$I_{CSI-RS}-5$
15 – 34	20	$I_{CSI-RS}-15$
35 – 74	40	$I_{CSI-RS}-35$
75 – 154	80	$I_{CSI-RS}-75$

FIG. 5

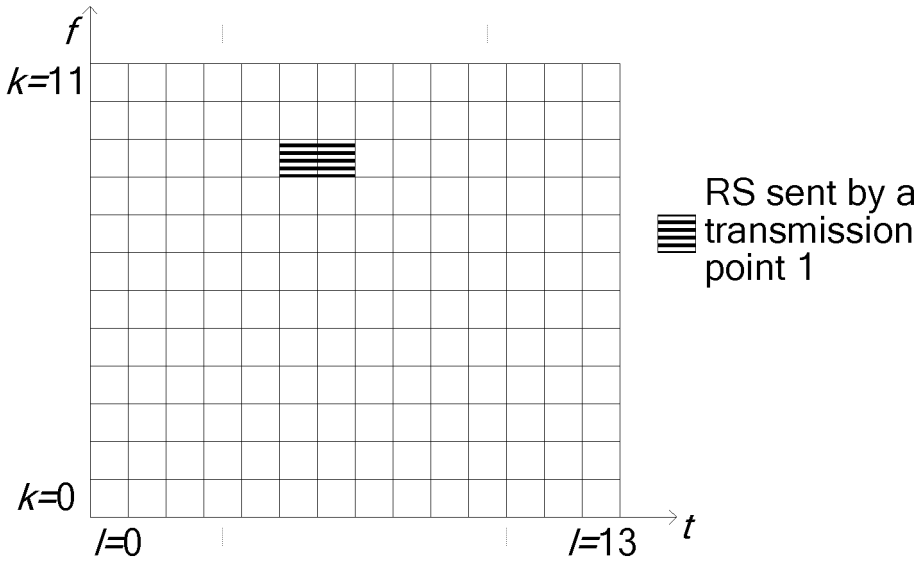
f
k=11
k=0
l=0
l=13
t
RS sent by a transmission point 1

FIG. 6

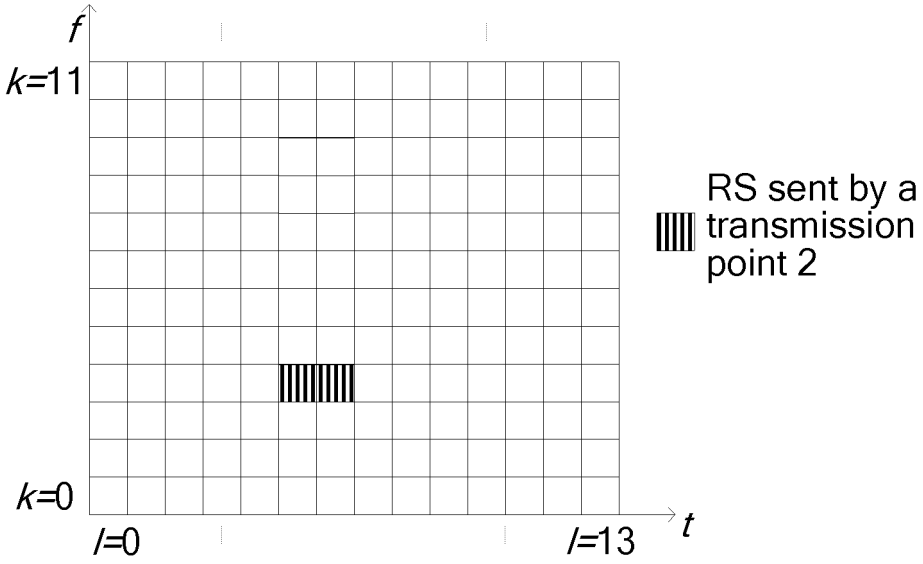
f
k=11
k=0
l=0
l=13
t
RS sent by a transmission point 2

FIG. 7

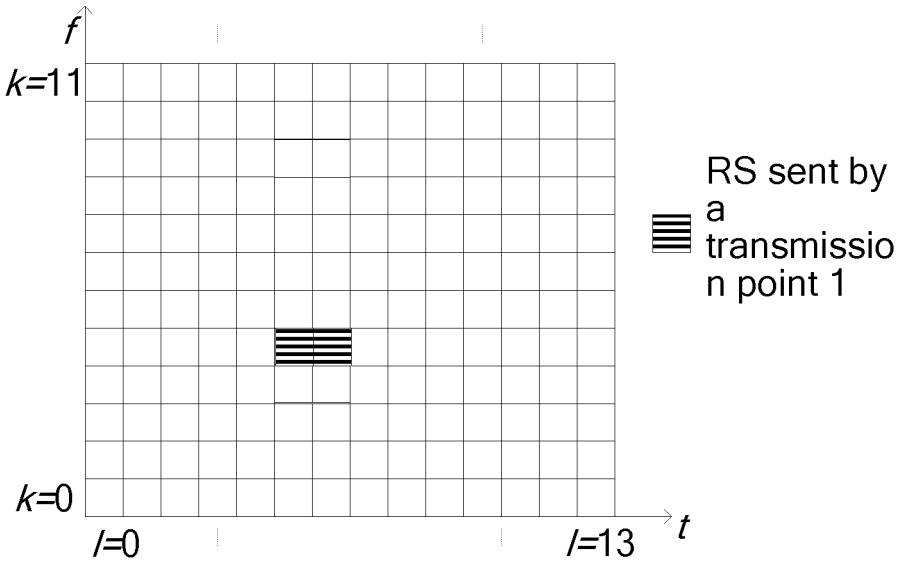
f
k=11
k=0
/=0
/=13
t
RS sent by a transmissio n point 1

FIG. 8

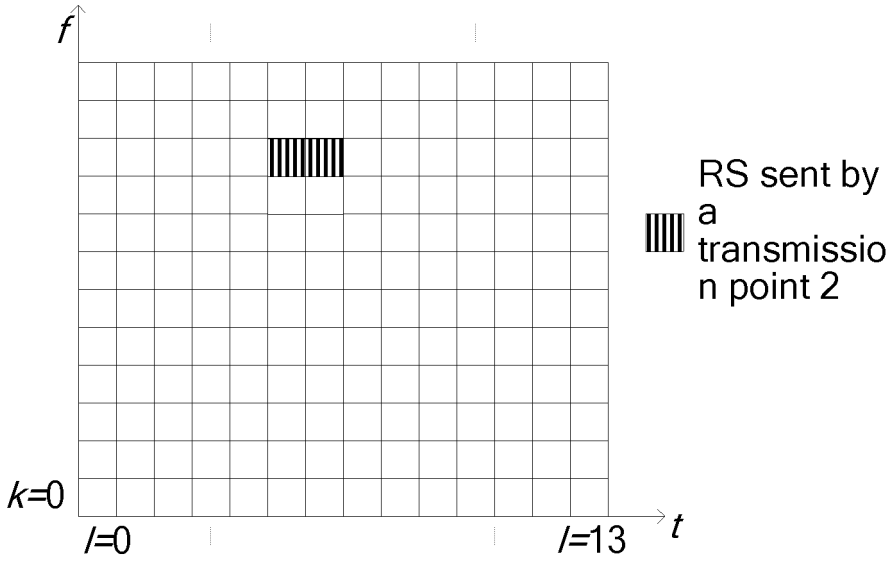
f
k=0
/=0
/=13
t
RS sent by a transmissio n point 2

FIG. 9

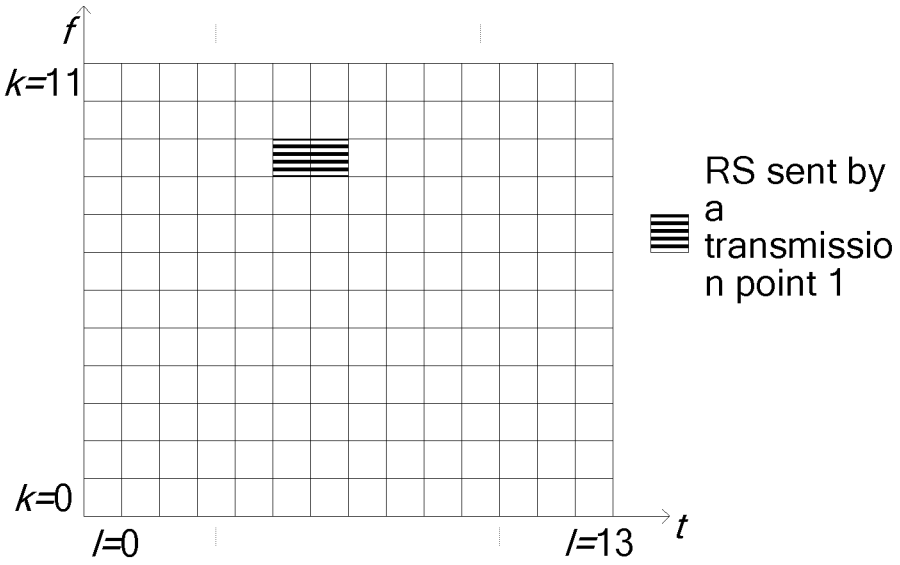
f
k=11
k=0
l=0
l=13
t
RS sent by a transmissio n point 1

FIG. 10

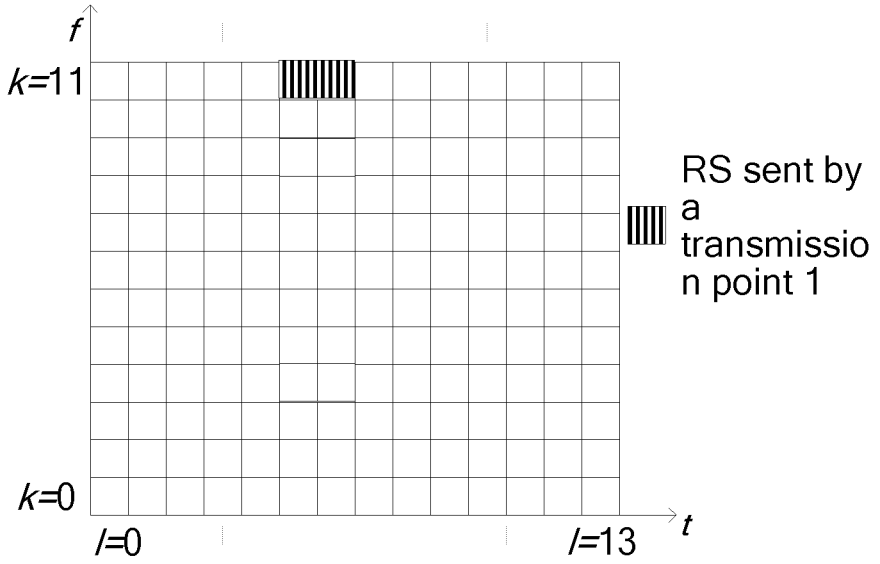
f
k=11
k=0
l=0
l=13
t
RS sent by a transmissio n point 1

FIG. 11

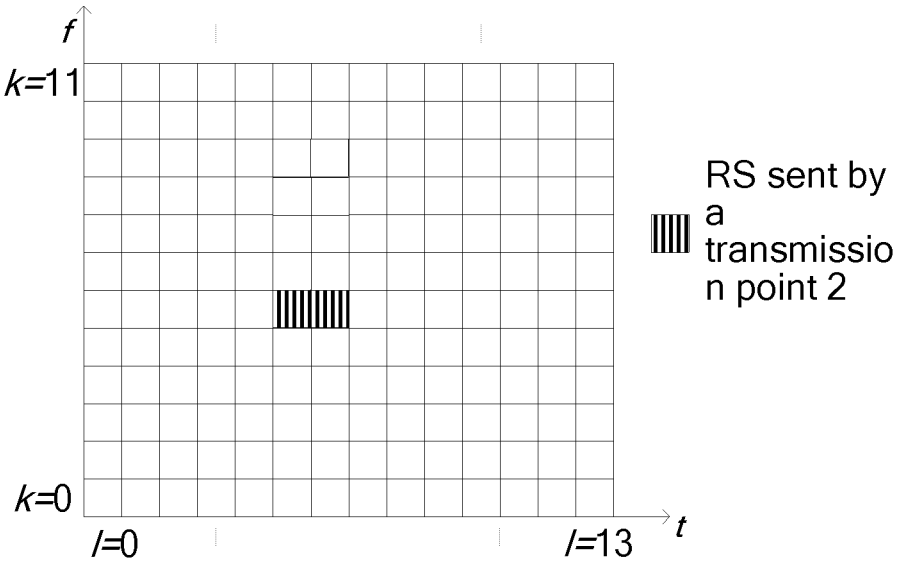

FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/086235

A. CLASSIFICATION OF SUBJECT MATTER

H04L 1/16 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H04W, H04L, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, CNTXT, CNKI, VEN: measure; channel, state, reference, signal, point, Differen???, feed back

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 101834707 A (ZTE CORP.), 15 September 2010 (15.09.2010), description, paragraphs [0002]-[0024]	1-12
X	CN 102026280 A (CHINA MOBILE COMMUNICATIONS CORP.), 20 April 2011 (20.04.2010), description, paragraphs [0008], [0047], [0048], and [0082]-[0086]	1-12
A	EP 2197125 A2 (ELECTRONICS & TLECOM RES INST), 16 June 2010 (16.06.2010), the whole document	1-12

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 February 2013 (18.02.2013)	**28 March 2013 (28.03.2013)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **SUN, Di** Telephone No.: (86-10) **62411246**

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/086235

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101834707 A	15.09.2010	None	
CN 102026280 A	20.04.2010	None	
EP 2197125 A2	16.06.2010	US 2010150214 A1	17.06.2010
		KR 20100068191 A	22.06.2010

Form PCT/ISA/210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201110418223 **[0001]**